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NOTES FOR STUDENTS.

PATHOLOGICAL ANATOMY.

A GUIDE IN THE POST-MORTEM ROOM.

PART I.

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THESE Notes are intended to assist the Student, when he begins to observe for himself the effects of disease on the healthy tissues of the body ; and to acquaint him with the terms used in describing those changes in their colour, density, and other qualities, which are distinguished by the eye and the touch, and are studied under the name of Morbid Anatomy.

It is hoped that they may prove useful as a simple introduction to the works which treat specially of this subject ; and that they may facilitate and encourage the early and independent observation of the numerous valuable and important facts contributed by the *post-mortem* room towards a sound basis of professional knowledge.

PATHOLOGICAL ANATOMY.

A POST-MORTEM examination is generally made with one of two objects, either to explain the symptoms which were observed during life, as is usual in hospital practice, or to ascertain the actual cause of death, as in medico-legal investigations. In both cases attention to method, accuracy of description, and avoidance of unnecessary details are equally important, though where the cause of death is doubtful or suspicious the necroscopical enquiry must leave nothing overlooked.

I.

The *post-mortem* examination begins with a careful inspection of the body, and a description of its general appearance and condition.

The **body** may be—

1. Well-developed or malformed ;
2. Well-nourished or emaciated ;
3. In good condition or more or less decomposed ;

Notes are made of—

4. The length of the body ;
5. The colour of the hair and eyes—condition of the teeth, etc. ;

6. State of the skin — discoloured — infiltrated with fluid (œdematous), etc.—signs of injury—ecchymosis—wounds or abrasions (beginning with the head and passing downwards), *a*, p. 30 ;
 7. The temperature ;
 8. Rigor mortis ;
 9. Any special external signs of disease.
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The examiner stands on the right hand side of the body. A separate table or large dish is prepared for the reception of the organs.

II.—**THORAX.**

1. An incision is made from the upper margin of the sternum to the symphysis pubis, laying open the peritoneal cavity.
 2. The skin and muscles are reflected on both sides, so as to expose the sterno-costal articulations.
 3. The sternum is removed by dividing the sterno-clavicular joints, and the sterno-costal cartilages close to the ends of the ribs.
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III.

Before disturbing the organs—

Note the position of the heart and lungs ; the presence and amount of fluid—serous—sero-purulent—purulent—in the pericardium and pleural cavities ; also tumours—aneurismal—carcinomatous, etc.

IV.

1. Pass the left hand into the left pleural cavity, quite to the posterior part of the **Lung**; press it forward, draw it across to the opposite side, and divide (from behind) the bronchial tubes and blood vessels close to the root of the lung.

2. In a similar manner remove the right lung.

Place the lungs aside in their proper relative position.

3. Remove the **Heart**, raising it with the left hand, and dividing the vessels within the pericardium.

Place it aside between the lungs.

Note—adhesions of the lungs; state their locality — at the apex — posteriorly — laterally — partially — extensive—universal—easily detached (recent)—firmly adherent (of old standing); note also of fluid, the quantity, colour, nature, etc.

4. When the adhesions are so firm that the tissue of the lung is liable to injury, the costal pleural membrane should be separated *from the ribs* and intercostal muscles by carefully inserting one finger or the handle of the scalpel between them and the membrane, so as to remove it, preserving thus its adhesions to the lung.

When the pericardium is adherent to the heart the vessels should be divided outside the pericardium, and the heart and pericardium removed together.

5. In cases of thoracic aneurism—rupture of aorta—tumours, etc., where it is important to preserve the relations of the heart and vessels, the trachea should be divided in the neck, and the heart, lungs, etc., removed by dissecting *close to the spine*, behind the

trachea and vessels, and dividing the latter just above the diaphragm.

V.—THE ABDOMEN.

1. **The Liver** is removed by drawing it firmly away from the diaphragm, and dividing its attachment, then raising it from the abdominal cavity, turning it upwards and dividing its connections with the duodenum.

2. **The Spleen** is removed by drawing it out of the abdomen and dividing its attachments.

3. **The Stomach.** Pass a ligature round the œsophageal end close to the diaphragm ; then two ligatures an inch apart round the middle of the duodenum, divide between them, and dissect the stomach out, preserving the ligatures intact.

Place the stomach and contents in a separate basin.

4. **The Intestines.** Ligature the rectal end of the colon ; divide beyond ; draw the intestines first to one side, then to the other, dividing the abdominal attachments of the mesentery, and remove the intestines.

Place them aside on a separate dish.

5. **The Kidneys and Supra-renal Capsules** are removed by making incisions close to the spine, and passing the fingers around the kidney, separating it from the cellular tissue in which it is embedded. Some care is required in extracting the supra-renal capsules ; that on the right side is easily injured in removing the liver.

Place the kidneys aside in their proper relative position on the dish.

6. **The Bladder**, and in the female the **Uterus** and **Ovaries**, may be removed by drawing them upwards from the pelvic cavity and dividing their tissues close to the wall of the pelvis.

N.B.—When there has been inflammation of the peritoneum there may be lymph, serum, pus, adhesions, etc., which should be noted as they become evident in the course of the examination. When there are tumours, cancerous deposits, enlargements of any of the organs, a careful note or a diagram should be made. In cases of difficult diagnosis this is important.

The well known danger of infection in cases of peritoneal inflammation may be avoided by covering the hands with carbolic oil, and pouring from one to two gallons of carbolic acid and water (1 in 60) into the abdominal cavity.

It is usual—

1. To examine the organs in the order in which they have been removed as above described.

2. To open the cranium and examine the brain, and if necessary the spinal cord.—(*Vide* p. 26.)

3. To describe any particular conditions of the body, such as abscess, disease of bone, inflammation or plugging of vessels, etc.

The observance of this method prevents confusion, and is particularly useful in legal enquiry. The general plan is indicated in these notes.

VI.—THE LUNGS.

Examine the left lung first.

Open the bronchial tubes with scissors. Observe—

1. The quantity and character of the mucus—frothy—viscid—sanious—purulent, etc.

2. The condition of the mucous membrane—pale—red—congested—thickened—striated. The smaller tubes—dilated—fusiform, etc.

3. Ulcerations of the mucous membrane—communications with cavities or tubercular deposits.

4. The bronchial glands—tubercular—indurated, etc.

Divide the lung by a single section from apex to base. Observe the surface of the section—

1. Differences of colour—pink—red—grey—dark—mottled, etc.

2. The fluid which exudes on pressure—frothy—sanious (mixed with blood)—purulent, etc.

3. Changes in particular parts—induration—consolidation—tubercular deposits—cavities, etc.

IMPORTANT OBSERVATIONS ON THE LUNGS.

Significance of Colour. It is to be remembered that **colour** should be carefully distinguished from **textural** changes.

The **colour** of the lungs, and other organs, is chiefly due to the nature of the fluid they contain, and is not

permanent, but may be removed by immersion in water, etc., as is apparent in museum preparations.

The **textural changes** are discerned by the touch and the scalpel. We use such terms as crepitant—noncrepitant—condensed—indurated—carnified—fibrous—cartilaginous—calcareous—moist—dry, and others, which, though of familiar sense, have become accurate pathological expressions.

Congestion is caused by excess of blood, which produces more or less uniform—varied shades of red—red-brown—purple—dark—very dark, etc.

The tissue is heavy and moist. When congestion has continued for some period during life (**chronic**) these changes are more decidedly marked.

Hypostatic congestion, due to the position of the body, is frequent in the **lower** and **posterior** parts of the lungs.

Œdema. When the tissue is infiltrated with fluid, generally from disease of the heart, liver, kidneys, etc., it becomes heavy, moist, noncrepitant, and exudes fluid when compressed.

Emphysema is caused by vesicles full of air—dry, crepitant—crackling when firmly compressed, commonly found along the margin of the upper lobes, which are irregularly puckered. Sometimes the disease is extensive.

It causes the lung to project when the sternum is removed.

The collections of air are formed by dilatation of

air vesicles, generally several vesicles being converted into a closed sac by degeneration of adjacent walls.

Carnification is produced by compression of the lung by fluid in the pleural cavity, by thickened pleura, etc. The tissue is dense, tough, airless, mottled, and spotted dark grey, and black.

Pneumonia, or inflammation of the lungs, begins with hyperæmia or congestion, causing more or less redness; is followed by *red* or *grey hepatisation*; the first is exudation of lymph cells; the second, of pus cells into the air vesicles. In red hepatisation the lung is firm, dense, without air, and heavy, so that it will sink in water. A section presents a uniform reddish-brown colour.

In grey pneumonia, the tissue is not quite so firm, and is more moist, exuding pus when compressed, or scraped with the scalpel. A section presents a more or less grey and pale yellow surface, mottled with spots or streaks of darker colour.

Sometimes the whole of an upper lobe, or the entire lung may be solid from red or grey pneumonia.

There is also a 'low form of pneumonia', frequent in such diseases as typhoid, erysipelas, septicæmia, puerperal fever, etc. A section shows 'spots' or 'areas' of congestion of dusky red or purple colour, darker in the centre than the circumference. The minute bronchial tubes contain frothy, slightly 'blood-stained mucous', or 'muco-purulent fluid'.—(*Vide* Secondary Deposits.)

Chronic or Interstitial Pneumonia. If the exudation into the air vesicles and small bronchial tubes is not removed by expectoration or absorption the

tissue of the lung becomes 'thick', 'tough', 'fibrous', etc.

Secondary Deposits. Collections of pus, usually round and minute, sometimes forming larger 'abscesses', are found in the lungs when particles of 'septic matter' have been arrested in the minute blood-vessels. They cause small, round areas of redness (congestion), exudation of lymph cells, and finally, pus.

Tubercle is a pathological change in the tissue of the lung, that is, in the walls of the air vesicles, from which a permanent destruction of the tissue results. The origin of this change must always remain beyond the range of simple pathological analysis.

Tubercles may be very small, round, hard, or cartilaginous, 'miliary', 'granular'. Their colour on section is yellow or grey, with minute dark spots in the centre.

Larger areas are similarly altered.

Inflammation is liable to occur around 'tubercular deposits', followed by 'suppuration', 'ulceration', and 'small cavities', which may coalesce, forming 'larger cavities'.

Note carefully the size and locality of cavities.

Pneumo-thorax. When the surface of the lung is perforated (usually from tubercular ulceration), and air passes from a bronchus into the pleural cavity, the lung collapses and the space in the thorax is filled with air, causing pneumo-thorax.

The exact space where **perforation** has taken place is ascertained by inflating **the lung** before making incisions.

Hydro-thorax is the effusion of serum.

Empyema is the effusion of pus into the pleural cavity.

VII.—THE HEART.

Average weight—Male, $9\frac{1}{2}$ oz. ; female, $8\frac{3}{4}$ oz.

Dimensions of orifices—

Mitral	= 4 in.	Aortic	= $3\frac{1}{6}$ in.
Tricuspid	= $4\frac{1}{2}$ „	Pulmonary	= $3\frac{1}{2}$ „

Pericardium. Inflammation affects the pericardium like other serous membranes ; lymph, serum, pus, may be effused, causing ‘adhesions’, ‘opacities’, ‘milky spots’.

The lower third of the heart should be removed by an incision across both ventricles ; the left ventricle and auricle opened with scissors on the anterior side ; and the aortic conduit posteriorly, so that the mitral and aortic valves may be as little injured as possible.

The right cavities are similarly exposed.

The first important point to determine is the size of the orifices, which is most accurately done with a pair of compasses, the points of which are applied to the extended valve, where it has been divided, and the measurement determined by applying the compasses to a linear scale.

There are three points to observe in examining the heart—

1. The thickness of the walls of the ventricles (or hypertrophy).

2. The size of the four cavities.

3. The condition of the tissues, valvular and muscular.

When the heart is large, and the walls thick, we look for the cause in some disease of the valves, or some resistance to the blood-current external to the heart.

Disease of the valves is caused nearly always by **inflammation** or **degeneration**; they are very different from one another.

Inflammation may occur early in life, and is common in acute rheumatism. It causes an exudation into the tissue, on the surface and on the edges of valves, and forms minute 'beads' or 'tufts' of 'fibrin'.—(*Vide* Note 1.)

The results are 'thickening', 'contraction', and 'induration', which impair the perfect closure of the valves.

Degeneration of the valves is pathologically the same as the condition of the large and small arteries called **Atheroma**. Only 'fat' or 'oil' globules are sometimes found in the areas of degeneration; sometimes 'calcareous' or 'phosphatic deposits'. These changes give rise to various kinds of 'murmurs', according to their effect upon the elasticity of the valves, and walls of the vessels, which become more or less 'rigid', 'contracted', etc. (*Vide* p. 28.)

As many diseases are due to this state of the vessels, *e.g.*, aneurism, cerebral apoplexy, senile gangrene, etc., the subject deserves great attention.

Atheroma is very common in the aorta, where it

may be seen in its early stage affecting small areas, and forming yellowish opaque spots under the lining membrane of the vessel. From this stage, it passes on to the calcareous condition.

NOTE 1. EMBOLISM.—When the margins or surface of the valve are rough from ulceration, as sometimes happens both in inflammation and atheroma, fibrin is deposited from the blood in small tufts, which are carried away, and are arrested in the small arteries; sometimes in those of the brain, the optic nerve, the spleen, kidney, etc. They generally produce inflammation, a 'zone of congestion', etc., around them.

VIII.—THE LIVER.

Note the weight; depressions; prominences; irregularities of the upper and lower surface and margins.

Make complete sections of an inch in breadth from upper to lower margin.

In a *perfectly healthy liver*, the surface of a section presents an uniform purple-brown colour, and to this we refer for comparison.

Congestion. We can distinguish two colours: one dark brown-purple, the other light yellow or buff.

The **dark** colour is due to the blood in the vessels; the **light** to the glandular and connective tissue. The contrast is sometimes strongly marked—'nutmeg liver'.

Cirrhosis; caused by the growth of fibrous tissue between the lobules, around the vessels, and beneath the capsule; increases the density and toughness of the tissue; causes adhesion of the capsule; more or less prominent irregularities of the surface; and on

section circles of light-yellow fibrous tissue around the vessels.

The Fatty Liver is pale-yellow, soft, and greasy ; many diseases, as phthisis, cause this degeneration of the glandular tissue of the organ.

Lardaceous or Amyloid Disease. The whole organ is usually enlarged ; the surface is smooth ; the margin sharp. The tissue, as seen on section, shows minute or larger areas of semi-transparent, dull, grey colour, which, *on application of tincture of iodine*, become violet-brown.— (*Vide* Amyloid Disease, p. 30).

Secondary Deposits, Abscess, etc. In pyæmia, and particularly when there is ulceration of the intestines, small centres of inflammation, terminating often in abscesses, are found in the liver. It is almost always from such causes that these abscesses are formed. They are frequent in dysentery.

Cancer. Tumours are of various sizes, but generally round in form. Section presents a grey or yellowish-white colour ; the texture is usually dense and firm ; they may project on the surface, with central depressions ; when hard, they are ‘scirrhus’ ; when soft, ‘encephaloid’ ; though these distinctions are difficult.

IX.—THE SPLEEN.

Note weight and irregularity of shape. Observe the following points:—

1. The state of the capsule, which may be more or less thickened from fibrous tissue.

2. The colour of the section, which may vary from slight brown-purple to very dark, dusky purple.

3. The quality of the tissue, which may be 'soft', 'very soft', 'diffuent', or 'firm', and 'somewhat resisting'.

4. Any defined, localized textural changes, which may result from embolism, abscess, lardaceous (amyloid) disease, tubercle, adenoid, or cancerous disease.

If the section presents an uniform colour, although the spleen may be much increased in size, we may conclude that this is caused by some defect in the general circulation, due probably to disease of the heart or liver.

If the texture is very soft, there has probably been some general morbid condition of the body, which has affected the blood, such as typhoid, pyæmia, etc.

Examine for Amyloid Disease in the same way as for the Liver—p. 17.

X.—THE KIDNEYS.

Note the weight of each separately.

Divide into anterior and posterior half. Detach the capsules (as far as possible).

OBSERVATIONS.

There are two conditions of the kidney, quite distinct from one another ; the one is—

1. **Inflammation**, common after scarlatina ; the other is caused exactly in the same way as cirrhosis of the liver. Fibrous tissue forms beneath the capsule, around the vessels, destroying the secreting structure, and producing what is termed the

2. **Granular condition.**

The first of these, true ‘Inflammation’, presents different appearances at different stages, and the history of a case will often assist in understanding them.

There are three points to observe :—

1. The facility with which the capsule is detached.
2. The redness (congestion).
3. The textural quality, not firmer or tougher than natural.

a. If **Inflammation** has been recent, we expect to find the kidneys large—soft—dark-red in colour—full of blood—the capsule free—the surface smooth. We may consider this the first stage or period of congestion and exudation.

Note differences in colour and depth of cortical, as compared with pyramidal, structure.

b. When the exudation has ceased, a process of absorption and removal of the exuded material takes place, chiefly by conversion of that material into oil globules. The tissue of the kidney thus becomes paler, particularly the cortical structure, and while the kidney is larger than natural, and its capsule free,

it differs in colour so much, that it is known as 'the large, white, oily kidney'.

There is no necessary connection between

1. 'Inflammation', or 'Acute Nephritis', and
2. The **Granular condition**.

The kidney is generally reduced in size and weight, though not always so. The capsule adheres; the surface (even before the capsule is detached) is finely nodulated or 'granular'.

On section, the **cortical structure** is **diminished**. The tissue is firm and tough; and in advanced cases, small cysts, containing clear yellow fluid, are seen under the capsule and in the cortical tissue. Spots of opaque yellow-white cerate of soda are occasionally seen.

We may compare acute inflammation of the kidney to pneumonia; and granular disease to chronic bronchitis. We may find congestion and evidences of inflammation in the 'Granular Kidney'; and those attacks of albuminuria, which old persons are liable to, are due to such a cause.

Amyloid kidney. Rather large in size—capsule easily detached—surface smooth—section rather glistening, particularly in quite minute points,* turning violet brown on application of tincture of iodine.

Embolism. (*Vide* Note, p. 16.) Small round yellow-white spots, surrounded often by a margin of congestion, caused by fibrinous particles, detached generally from the valves of the heart.

Secondary Deposits. As in the liver—small

* The Malpighian bodies.

centres of congestion, terminating in abscesses of minute size. Occur in septic poisoning; common in inflammation of the bladder, particularly after surgical operation, when congestion and suppuration of the lylus, which is called

Pyelitis, and small abscesses in the tissue of the kidney, are met with.

Tubercular Disease. Minute, round, 'miliary' tubercles—the earliest stage;—more extensive as 'caseous masses';—when suppurating, causing ulceration of the tissue, and 'scrofulous abscess', which may discharge by the ureter; or, if close beneath the capsule, may cause a tumour in the lumbar region.

XI.—THE STOMACH.

Remove the ligatures. Empty the contents into a large vessel. Open the stomach along the lesser curvature.

1. Observe the condition of the mucous membrane; its colour,—pale; rose red; deep red; congested.

There is almost always more redness of the posterior and inferior part than of the anterior wall. Note condition caused by **irritant poisons**—'intense congestion', 'destruction of the mucous membrane', etc.

2. Note condition due to **disease of heart, liver**, etc., as 'congestion', 'colour and viscosity of mucus, etc.

3. Observe special pathological changes in the mucous membrane, the muscular tissue, and the

peritoneal membrane, due to tubercles—various forms of cancer; epithelial, villous, medullary, scirrhus, etc.

XII.—THE MESENTERIC GLANDS.

May be paler and more opaque than natural; enlarged—congested—indurated—serofulous—tubercular—cancerous.

In young children they are often the seat of chronic inflammation, which causes them to become yellowish-white, instead of the natural rose-red; slightly indurated, and oily. They are usually 'secondarily affected' in typhoid and tubercular inflammation of the bowel—'enlarged and congested'.

XIII.—THE INTESTINES.

Detach the intestine from the mesentery. Remove the ligatures, and wash away the excreta by attaching the duodenal end of the bowel to a water-tap. While distended with water, open the canal **along the mesenteric line of attachment.**

The condition of the mucous membrane is noted as in the case of the Stomach—the part and extent distinctly stated.

The most frequent pathological change is in the solitary and Peyer glands, which may be 'enlarged'—'prominent'—'congested'—'slightly' or 'extensively ulcerated'. The ulcers may penetrate the muscular tissue, their edges 'soft' and 'sloughing'—'raised'—

more or less indurated (characters marking stages in the inflammatory process). The peritoneal covering may be 'thickened'—'almost destroyed'—'perforated'. Typhoid ulceration almost always attacks the ilio-cæcal region. Cicatrization may follow ulceration, producing small, round, or oval, smooth surfaces, where the glands previously existed. This condition present in dysentery.

XIV.—BLADDER, URETERS, AND URETHRA.

Directions have been given to remove the bladder by dividing the urethra close to the symphysis pubis ; but if it is desired to preserve their continuity, as in cases of stricture, the parts should be drawn into the pelvis, and the urethra divided close to the glans-penis, without injuring the skin.

It may be necessary also to preserve the ureters, which is done by tracing them upwards from the bladder towards the kidneys.

Inflammation of the bladder, or cystitis. Make an incision through the anterior wall.

The walls of the bladder may be thickened, the muscular tissue hypertrophied ; the internal surface crossed by elevated bands and rugæ ; and the mucous membrane—soft—dark-red—purple—ulcerated. This condition is met with in obstruction from stricture, calculus, etc.

A yellow-white layer of ammoniacal phosphates may be deposited on the mucous membrane.

Note enlargement of the prostate, the condition of the urethra, strictures, false passages, etc.

XV.—UTERUS AND OVARIES.

It may be necessary to preserve the connections between the uterus and bladder. As a general rule great care should be observed in examining cases in which adhesions have formed between the organs in the pelvis, as is frequent in ovarian tumours, cancer of the uterus, extra-uterine fœtations, etc. Under these circumstances it is best to remove at once all parts involved, by dissecting close to the walls of the pelvis, and examine them in the laboratory.

Note the size of the uterus.

Make an incision through the anterior wall from the fundus to the cervix.

Observe the condition—

1. Of the mucous membrane.
2. Of the muscular tissue.
3. Of the peritoneal surface.

The mucous membrane may be congested—covered with ‘viscid’, ‘sanious’ mucus, etc.—inflamed—softened—dark in colour, etc., as is frequent in puerperal metritis, or after abortion. The cavity may contain remains of decidua and decomposing tissues.

In such cases all the tissues of the uterus may be affected, the muscular tissue soft and congested, the peritoneal surface inflamed, the cellular tissue around the cervical part of the uterus, and in the course of

the large vessels, indurated and infiltrated, giving rise to 'cellulitis', 'thrombosis', etc.

The cervix uteri may be hypertrophied, ulcerated, affected with scirrhus, epithelioma, etc.

These forms of cancerous disease affect the mucous membrane, muscular tissue, and surrounding structures, as in other organs of analogous nature.

The most common disease of the muscular tissue is the formation of **fibrous tumours** in the walls of the uterus. These may be quite small, yellowish-white, and very 'cartilaginous'; or they may be large, soft, and composed more or less of muscular tissue (myoma).

Note their size, texture, and position. Any special form of disease should be examined in the laboratory.

The Ovaries. Examine their surface; note size, irregularities, etc.

As these organs are composed of the fibrous tissue or *stroma*, and of the Graafian vesicles, morbid changes are observed in these structures, and should be described separately.

Divide the ovaries by section through the large circumference.

Note state of Graafian vesicles, true or false corpora lutea, cysts, etc.

In examining tumours of the ovaries we notice cysts and solid tissues; the contents of cysts are fluid—'clear', colourless, yellow, purulent, etc.; or gelatinous, colloid, etc.

The solid tissue, if much increased, is usually affected with some form of cancerous disease (sarcoma).

XVI.—**THE BRAIN.**

Examine the ears and note hæmorrhage or discharge. Make an incision through the tissues of the scalp across the vertex from ear to ear; reflect the anterior half of the scalp as far as the frontal ridge, and the posterior to the occipital ridge. Divide the temporal muscles with a scalpel just above the line of reflected scalp. A circular incision through the tables of the skull is made with a saw; and a chisel is used to elevate and detach the upper part of the skull, leaving the dura mater in position. If the dura mater adheres so firmly as to prevent this, it must be divided and removed, attached to the bones. This is rarely necessary.

Note the 'thickness' of the cranial vault—fractures—irregularities of the external or internal surface—necrosis, etc.

The intimate connection between the dura mater and the skull explains the fact that injury or disease of the latter affects the former.

The dura mater is 'easily detached', or is 'rather firmly'—'firmly adherent'.

Inflammation, the result of injury to the skull, causes 'congestion', 'suppuration', etc.

If there is any morbid growth in the dura mater, it should be preserved for examination in the laboratory.

In making note of injury to the bones of the skull, the 'line' and 'extent of fracture' should be carefully observed and followed up across the base of the skull. This may be done after the brain has been examined.

Before disturbing the brain, examine its surface, and press gently on the hemispheres. If there is any pro-

minence or softness, it is best to make the sections *in situ*, for sometimes hæmorrhage has lacerated the tissue, and in attempting to raise it the relation of parts is destroyed.

To remove the brain, raise the anterior lobes, divide the optic and other nerves close to the bones; raise the lateral lobes, divide the petrosal attachment of the dura mater; raise the brain from in front, and divide the spinal cord.

Place the vault of the skull, the dura mater, and the brain on a separate dish.

If the brain is pale in colour, and the convolutions are somewhat separated from each other, and the arachnoid can be easily detached, there has been 'serous' or 'subarachnoid' effusion, a condition frequent in wasting diseases.

The arachnoid may be thickened, particularly along the superior sinus, and at the base, a condition due to chronic congestion, and not of much pathological importance.

Meningitis, or inflammation of arachnoid, is generally caused by tubercle, almost always found at the base of the brain, and in the fissures of Sylvius.

Note minute granulations, effusion of 'yellow, adhesive', 'purulent' lymph, surrounding the vessels and nerves.

Lymph and pus are sometimes met with on the surface of the brain from acute inflammation of the arachnoid, not tubercular. In all diseases of the brain a special examination should be made in the laboratory.

Make horizontal sections of about half an inch thick

through the hemispheres, noting any morbid condition as it appears.

As a general rule morbid conditions of the brain depend either upon—

1. Disease of the blood-vessels, or
2. Disease of the proper tissue of the brain.

1. **Disease of blood-vessels**, of which degeneration or 'atheroma' is the commonest form, leads to 'dilatation', 'rupture', and 'apoplectic hæmorrhage'. — (*Vide* p. 15.)

When hæmorrhage is not fatal, changes take place in the clot which alter its colour to a yellow, firm mass, of no definite shape—the central part being darker than the circumference; and if a long period has elapsed we may find only a very dark-greyish black line or spot, as the evidence of hæmorrhage. The locality of such a 'cicatrix' should be carefully noted.

When hæmorrhage is fatal, it generally occurs in the optic thalamus or corpus striatum, and may produce 'extensive laceration', the blood escaping into and filling the ventricles.

The condition of the large arteries, the basilar, the circle of Willis, and the Sylvian, should be noted, as they are frequently 'atheromatous' and contracted. From this cause the circulation may be arrested, and thrombosis of an artery or gradual closure may occur. Care must be taken to distinguish this cause of blocking of arteries from **embolism**, where a minute particle of fibrin has been detached from some distant part, generally the valves of the heart.

The *sudden* blocking of an artery, as may be ex-

pected, produces a different appearance in the part of the brain it supplies, compared with that which is observed in cases of *gradual* contraction and closure of the vessel. Red, yellow, and white *ramollissement* are thus explained.

2. **Morbid Conditions.**—Diseases of the tissue of the brain may be produced by syphilis, tubercle, and morbid growths, the characters of which must be determined in the laboratory.

NOTES.

a. To distinguish between a bruise made during life and discoloration after death, make an incision through the skin. In the former case the tissue of the skin is red and blood-stained ; in the latter the discoloration is superficial, and the deeper tissue is of natural colour. Injury after death will not produce the same change as before.

Amyloid Disease. It is usual to find evidence of this change in the Liver, Spleen, Kidneys, and mucous membrane of the intestine in the same case. The disease begins in the minute arteries, and consequently in its early stage it is found in minute points, hardly visible to the naked eye unless in a good light, when treated with tincture of iodine.

